

# Synthesis and Superconductivity of $(\text{Mg}_{1-x}\text{Al}_x)^{11}\text{B}_2$ in High Pressure Condition

Min-Seok Park, J. Y. Kim, Kyung-Hee Kim, C. U. Jung, and Sung-Ik Lee

*National Creative Research Initiative Center for Superconductivity  
And Department of Physics, Pohang University of Science and Technology,  
Pohang 790-784, Republic of Korea*

We synthesized the high quality Al doped inter-metallic  $\text{MgB}_2$  compounds using  $^{11}\text{B}$  boron isotope under high pressure. Superconductivities of  $(\text{Mg}_{1-x}\text{Al}_x)\text{B}_2$  with  $x=0$  to  $0.4$  were characterized by magnetization and resistivity measurements. Superconducting volume fraction (SVF) was vastly improved compared with that obtained from the ambient pressure method, and there, especially, was no definite degradation in SVF with increasing the Al doping rate. From XRD and SEM (including of EDS), we saw a structural instability around 10% Al doping. Al is well substituted in Mg site which was confirmed by a shift of 002 peak and the EDS analysis. Small amount of MgO as a minor impurity phase was detected by XRD measurement. SEM images showed smaller size grains of few hundred nanometer for the case of 30% Al doping. The effect of doping on the superconductivity will be studied.

keywords : Al doping, SVF, structural instability,  $\text{MgB}_2$